15th, tug Carrington left for Port Sarnia. Cleveland, 21st, scow arrived loaded with stone, first boat since close of navigation. Sandusky, 3rd, ice breaking up; 5th, large masses moving out; 9th, first steamer arrived. Buffalo, 1st, creek and harbor free of ice. *Hudson River.*—Albany, 28th, river entirely free of ice, rose 11 feet in past 36 hours, causing considerable damage to property. *Watuppa Lake.*—Fall River, Mass, lake clear of ice throughout the month. *Lake Champlain.*—Burlington, Vt., 1st, 22nd to 25th, 28th, 31st, floating ice in lake. *Merrimac River.*—Newburyport, Mass, river and harbor free of ice throughout the month, except on the 1st, 14th, 27th, 28th, 30th, when small quantities of floating ice appeared.

High Tides.—Cape Lookout, N. C., 14th, 15th, 26th, Fort Macon, N. C., 11th, 12th, 13th to 16th; Portsmouth, N. C., 14th,

Low Tides.—Indianola, Tex., 1st, 2nd, 10th, 11th and 12th.

TEMPERATURE OF WATER.

The *temperatures of water*, as observed in rivers and harbors, with average depth at which observations were taken, are given in the table on left side of chart No. II. At the following stations observations were not made on the dates indicated, on account of ice, at Alpena and Escanaba during entire month; Chicago, 1st, 2nd and 3rd; Detroit, 1st, 2nd, 3rd, 10th, 11th, 12th; Duluth, 1st to 13th inclusive, 22nd to end of month; Grand Haven, 1st, 2nd and 3rd; Marquette, 28th to 31st; Sandusky and Toledo 1st to 6th.

ATMOSPHERIC ELECTRICITY.

Thunder-storms were reported in the various states and territories on the following dates: Pennsylvania, 20th, 21st; New Jersey, Maryland, Virginia and West Virginia, 20th; North Carolina, 9th, 22nd; Georgia, 8th, 21st, 26th, 27th; Florida, 25th; Alabama, 17th, 21st; Mississippi, 21st, 22nd; Louisiana, 5th, 21st; Texas, 1st, 2nd, 3rd, 4th, 24th, 29th, 30th, 31st; Arkansas, 7th; Indian Territory, 29th; Tennessee, 6th, 21st, 22nd at Nashville the thunder-storm of the 21st was very severe, the heavy peals of thunder and and vivid flashes of lightning, 10:10 p. m. being a marked feature of the storm; Kentucky, 7th, 8th, 21st; Ohio, 8th, 21st, 22nd; Illinois, 7th, 8th, 21st; Indiana, 7th, 8th, 12th, 17th, 21st; Missouri, 19th, 21st, 29th; Iowa and Nebraska, 29th; Kansas, 22nd, 29th.

Auroras.—Harvard College Observatory, Cambridge, Mass., looked for every clear evening, but none seen. Guttenburg, Ia., 28th, 9 p. m., diffuse light, no streamers; Independence, Ia., 16th; Gardiner, Me., 28th; Austin, Nebr., 4th; Starkey, N. Y., 11th, 20th, 24th; Milton, Pa., 11th, 7 p. m., arch extended from northeast to southwest, disappeared at 8:40 p. m.; Coalville, Utah, 30th; Tucson, Ariz., 8th; Eastport, 7th, 11:40 p. m., 8th, 3 a. m.; Newport, R. I., 4th, 11:30 p. m.; Burlington, Vt., 7th.

Telegraphic Communication interferred with by Atmospheric Electricity.—Mason, Tex., 2nd, 3rd; Davis, Tex., 1st, 2nd; Cape Hatteras, N. C., 22nd.

OPTICAL PHENOMENA.

Solar Halos were observed in the various districts on the following dates: New England, 16th, 17th, 18th, 22nd, 24th, 25th, 26th 28th, 29th; Middle Atlantic States, 2nd, 3rd, 5th, 16th, 17th, 18th, 19th to 30th; South Atlantic States, 1st, 3rd, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 22nd, 23rd, 24th, 25th, 27th, 28th; Eastern Gulf States, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 28th; Western Gulf States, 15th, 16th, 17th, 18th, 19th, 21st, 22nd, 23rd, 24th, 26th, 28th, 29th; Lower Lake region, 17th, 19th, 21st, 24th, 25th, 27th, 28th, 29th, 31st; Upper Lake region, 5th, 16th, 17th, 24th, 25th, 26th, 27th, 28th, 29th; Ohio valley and Tennessee, 1st, 2nd, 14th, 15th, 16th, 19th, 20th, 21st, 23rd to 29th; Upper Mississippi valley, 1st, 15th to 29th; Missouri valley, 2nd, 4th, 14th to 20th, 24th to 31st; Eastern Rocky Mountain slope, 1st, 2nd, 14th, 17th, 18th, 23rd, 25th, 27th, 28th; Rocky Mountains, 15th, 20th, 21st, 23rd, 24th, 29th; Western Plateau, 17th, 18th, 21st, 23rd, 24th, 26th, 27th; California, 2nd, 4th, 19th, 22nd, 24th, 25th, 26th.

Lunar Halos were observed in the various districts on the following dates: New England, 5th, 13th, 15th, 17th, 25th, 26th, 27th, 30th; Middle Atlantic States, 5th, 15th, 16th, 17th, 21st, 23rd, 25th, 26th, 30th; South Atlantic States, 20th, 21st, 23rd; Eastern Gulf States, 5th, 16th, 19th, 20th, 22nd, 23rd; Western Gulf States, 9th, 19th, 29th; Lower Lake region, 6th, 8th, 9th, 10th, 11th, 19th, 20th, 25th; Upper Lake region, 13th, 16th, 18th, 24th, 26th, 28th; Ohio valley, 1st, 14th, 24th, 25th, 26th, 28th, 29th; Upper Mississippi valley, 10th, 11th, 14th, 15th, 17th, 19th, 23rd, 24th, 25th, 26th, 28th, 30th, 31st; Missouri valley, 5th, 11th, 16th, 19th, 20th, 23rd, 24th, 25th, 26th, 27th, 28th; Rocky Mountains, 7th, 15th, 18th, 27th, 28th, 29th; California, 9th, 11th, 24th, 29th.

Mirage.—Olivet, Dak., 30th; Genoa, Neb., 17th, 18th, 22nd, 23rd, 24th, 30th, 31st; Pembina, Dak., 20th, 23rd, 24th.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service Stations. Reports from 137 stations show 4,183 observations to have been made, of which 35 were reported doubtful; of the remainder, 3,486, or 84.0 per cent., were followed by the expected weather.

Meteors.—Wabash, Ind., 19th, between 5 and 6 a. m., "a large meteor passed over the city making the

whole heavens a brilliant glow of light. It was apparently some three feet in diameter and left behind it a long fiery train of different colored sparks." Southington, Conn., 2nd; Lyndon, Ill., 12th, 15th; New Corydon, Ind., 10th, 12th, 13th, 15th, 19th, 24th; Monticello, Ia., 6th; Yates Center, Kan., 5th, 7th; Woodstock, Md., 3rd, 10th, 16th, 24th, 29th, 31st; Rowe, Mass., 1st, 2nd, 15th; Fall River, Mass, 31st; Fayette, Miss., 3rd, 10th; Ashley, Miss., 17th; Clear Creek, Neb., 3rd, 31st; Genoa, Neb., 7th; Grafton, N. H., 21st; Freehold, N. J., 17th, 31st; Waterburg, N. Y., 2nd, 10th, 13th; Starkey, N. Y., 16th; Jacksonburg, Ohio, 18th; Los Angeles, Cal., 8th; Dodge City, 9th; Davis, Tex., 8th; Mobile, Ala., 30th; Pensacola, Fla., 10th; Milwaukee, Wis., 6th.

Earthquakes.—Key West, 22nd, 11:10 p. m., "severe shock passed over the island, lasting one minute; a rocking motion, from southwest to northeast, was felt by many persons in the upper stories of buildings along a path not more than 100 yards wide; vessels in the harbor did not feel the shock, and no noise accompanied it." Havana, Cuba, 22nd, 11:04 p. m., "light shock of ten seconds duration, three oscillations from southeast to northeast; 23rd, 3:45 p. m., another light shock of less duration; 26th, at about 5 a. m., still another shock was experienced by many persons; in the western portion of the island shocks have been generally felt for several days, accompanied with continued subterraneous thunder or roaring; the boroughs of San Cristobal and Candelaria are in ruins, and several persons killed, wounded and contused; on the night of the 29th, four light shocks were felt at San Cristobal. On the Isle of Pines, 22nd, shock at 11 p. m.; 23rd, at 4 a. m. and 9 p. m.; 26th, at 4:30 p. m. and 1 p. m." San Salvador, C. A., 22nd. "violent shocks were felt in the interior: much damage is reported from Libertas; the earth at this place seemed literally to be dancing; persons were thrown to the ground and many buildings suffered; the lake of Ilopango was in motion like a boiling cauldron, emitting dense sulphurous vapors; industries of all kinds suspended." In California on the 9th "at Hollister, San Benito county, about 6 a. m., heaviest earthquake shock ever felt here; vibrations from NE. to SW. continued over twenty seconds; Gonzales, Monterey county, 5:45 a. m., quite a perceptible shock felt; Santa Cruz, Santa Cruz county, 5;45 a. m., shock from N to S., lasting from fifteen to twenty seconds." Yokohama, Japan, December 3rd, 1879, 7.09 a. m., severe shock; duration, 20 seconds; at 9:45 a. m., light shock; 7th, 5:10 a.m., light shock; 11 a.m., light shock.

Polar Bands.—New Corydon, Ind., 1st, 13th, 15th, 17th, 24th, 26th, 27th, 31st; Guttenburg, Iowa, 28th; Glenwood, Iowa, 4th, 11th, 19th; Yate's Center, Kan., 11th; Gardiner, Me., 15th, 28th; Thornville, Mich., 4th, 24th; Clear Creek, Neb., 4th, 5th, 8th, 10th, 11th, 14th, 15th, 16th, 18th, 19th, 20th, 23rd, 25th; Auburn, N. H., 15th, 26th; Vineland, N. J., 21st, 26th; Wytheville, Va., 24th, 25th, 26th, 28th; Toledo, 24th; Barnegat, N. J., 28th; Atlantic City, N. J., 28th.

Prairie and Forest Fires.—Morriston, Dak., 18th; Ft. Dodge, Kan., 13th to 19th; Glenwood, Ia., 16th; Creswell, Kan., 5th, 8th, 9th, 11th, 14th, 15th, 18th to 22nd, 25th, 27th, 28th, 30th; Independence, Kan., 9th, to 29th; Wellington, Kan., 23rd; Lake Charles, La., 24th; North Platte, 10th; Deadwood, Dak., 8th; Ft. Gibson, Ind. Ty., 9th, 11th, 12th, 14th, 16th; Henrietta, Tex., 11th, 16th, 17th.

Sun Spots:—The following record of observations made by Mr. D. P. Todd, Assistant, N. A. O., has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent Nautical Almanac Office, Washington, D. C:—

Date—Jan., 1880.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
1st, 12 m.....	1	2	0	0	0	0	1	2	Spots small.
1st, 3 p. m...	0	0	0	0	0	0	1	2	
4th, 1 p. m...	3	22	0	0	3	22	4	24	Faculæ; many of the spots small. The new spots probably reappeared by solar rotation.
8th, 2 p. m...	0	0	2	8	0	0	2	16	
10th, 8 a. m...	0	0	0	0	0	0	2	24	A few of the spots very large.
10th, 3 p. m...	1	2	0	0	0	0	3	26*	
13th, 9 a. m...	0	0	0	0	0	0	3	26*	
14th, 9 a. m.	1	4	0	0	0	0	4	30*	Faculæ.
14th, 4 p. m...	0	0	1	4	0	0	3	26*	
15th, 3 p. m...	1	4	1	10	1	4	3	20*	Faculæ.
18th, 10 a. m...	0	0	1	10	0	0	2	10	Faculæ.
18th, 4 p. m...	0	0	0	0	0	0	2	10	
19th, 9 a. m...	0	0	0	3	0	0	2	7	
21st, 9 a. m...	0	0	1	5	0	0	1	2	Faculæ.
23th, 9 a. m...	0	0	1	2	0	0	0	0	
24th, 2 p. m...	0	0	0	0	0	0	0	0	Faculæ.
25th, 5 p. m...	0	0	0	0	0	0	0	0	
26th, 9 a. m...	1	3	0	0	0	0	1	3	Several groups of faculæ.
28th, 9 a. m...	1	1	0	0	0	0	2	4	Faculæ.
28th, 5 p. m...	0	0	0	0	0	0	2	4	
29th, 9 a. m...	0	0	0	0	0	0	0	0	Faculæ.
31st, 4 p. m...	2	9	0	0	?	?	2	9	Spots quite large—probably reappeared by solar rotation.

*Approximated.

NOTES AND EXTRACTS.

Generation of Cyclones.—In an elaborate report upon the Madras Cyclone of May 1877, Mr. J. Eliot gives the following general conclusions relating to cyclone generation in the Bay of Bengal:

1. Cyclonic disturbances of small intensity are of frequent occurrence during the prevalence of the southwest monsoon or rainy season. Cyclones, or revolving storms of great extent and intensity, occur only at the two transitional periods, *viz.*, at the April transitional period preceding the southwest monsoon, and the October transition period succeeding the southwest monsoon, and ushering in the north-east monsoon.

2. Cyclone occurrence is most probable during the October transition period.